

REMARKS

Claims 31-37 are pending in this application. Claims 31 and 34, which are in independent form, have been amended to define more clearly what Applicant regards as the invention. Favorable reconsideration is requested.

The specification has been amended to correct typographical errors. No new matter has been added.

Claims 31-37 were rejected under 35 U.S.C. § 103(a) as being obvious from U.S. Patent 6,657,665 (“Guidash”) in view of U.S. Patent 5,892,541 (“Merrill”).

In general, the present invention relates to a solid image pickup device having a pixel structure and including a charge transfer means provided between a photoelectric conversion unit and a charge-voltage conversion unit. The present invention addresses a specific technical problem in the pixel structure of such devices, that is, the problem that signal transfer from the photoelectric conversion unit to the charge-voltage conversion unit by the charge transfer means may not be fully performed, resulting in residual charges that are not transferred, due to a decrease in the voltage of the power source.

Claim 31 recites, *inter alia*, a method of driving a solid image pickup device, including a step of performing a primary transfer operation to transfer at least a part of the photoelectric charges accumulated in the photoelectric conversion unit during a charge accumulation period, from the photoelectric conversion unit to the charge-voltage conversion unit. At least one other transfer operation is performed, prior to a subsequent charge accumulation period, to transfer remaining photoelectric charges from the

photoelectric conversion unit to the charge-voltage conversion unit. The photoelectric conversion unit is not reset prior to the at least one other transfer operation.

These claimed features may be understood by referring, by way of example, to the specification at page 14, line 26, through page 16, line 25, which describes a charge accumulation, transfer, and readout sequence. As shown in Fig. 2, a primary transfer (e.g., at time period T_1) and at least one other transfer (e.g., at T_6) are performed prior to the start of a subsequent charge accumulation period (e.g., beginning after T_6). Each of these transfer steps transfers a portion of the charge in the photoelectric conversion element (see, e.g., Figs. 1C and 1E). The transfer steps are followed by readout steps (e.g., at T_3 and T_7). This configuration helps prevents charges from being left behind in the photoelectric conversion unit during a charge accumulation period, thereby improving the sensitivity of solid image pickup device and preventing an after-image in the device.

It should be noted that the reset operation indicated in Fig. 2 relates to the resetting of the floating diffusion region (e.g., 103), not the resetting of the charge accumulation region of the photoelectric conversion unit (e.g., 105), which in accordance with Claim 31, is not reset prior to the at least one other transfer operation (e.g., at T_6). Of course, the above is merely one specific embodiment, which in no way limits the scope of the claims.

By contrast, Merrill relates to an imaging system that seeks to increase dynamic range by reading the photodiode cells and determining if the read values are greater than a predetermined amount (see col. 7, lines 40-48). If so, the corresponding cells are reset (see col. 7, lines 59-67), otherwise the cells are “disregarded” and allowed to continue accumulating charges (see col. 7, lines 48-51). Neither of these operations

corresponds to the claimed transfer operations which transfer the photoelectric charges accumulated in the photoelectric conversion unit during a charge accumulation period, from the photoelectric conversion unit to a charge-voltage conversion unit, as recited in Claim 31. *A fortiori*, nothing in Merrill describes or suggests performing a primary transfer operation and an additional transfer operation during the charge accumulation period, without resetting the photoelectric conversion unit, as further recited in Claim 31.

The other reference cited by the Examiner, Guidash, relates to an amplification-type image sensor in which charges are transferred from pixels to charge conversion regions. The pixels may share a reset transistor and amplifier. Nothing has been found or pointed out in Guidash, taken alone or in combination with Merrill, that would describe or suggest the features of Claim 31 discussed above.

Accordingly, Applicant respectfully submits that Claim 31 is patentable over the combination of Guidash and Merrill.

Claim 34 recites features similar to those discussed above with respect to Claim 31. Specifically, Claim 34 recites that the solid image pickup device includes a control circuit for controlling the solid image pickup device to perform a primary transfer operation to transfer at least a part of the photoelectric charges accumulated in the photoelectric conversion unit during a charge accumulation period, from the photoelectric conversion unit to the charge-voltage conversion unit, and to perform at a least one other transfer operation, prior to a subsequent charge accumulation period, to transfer remaining photoelectric charges from the photoelectric conversion unit to the charge-voltage conversion unit. The photoelectric conversion unit is not reset prior to the at least one other transfer operation.

Accordingly, Claim 34 is also believed to be patentable over the combination of Guidash and Merrill.

The other claims in this application depend from one or the other of the independent claims discussed above, and, therefore, are submitted to be patentable for at least the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, individual reconsideration of the patentability of each claim on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicant respectfully requests favorable reconsideration and the allowance of the present application.

Applicant's undersigned attorney may be reached in our New York Office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address listed below.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Leonard P. Diana", written over a horizontal line.

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